

What is claimed is:

1. A graphical user interface for providing real-time process information to a user with regard to a process that is operable under control of one or more process variables, the graphical user interface comprising:
 - a scale extending along a gauge axis;
 - one or more bars extending along the gauge axis, each bar representative of a set of high and low process limit values for a process variable; and
 - a graphical shape displayed along the gauge axis representative of a current value of the process variable.
2. The graphical user interface of claim 1, wherein the one or more bars extending along the gauge axis include a first bar extending along the gauge axis, wherein a first end of the first bar is representative of an engineering hard high limit for the process variable and a second end of the first bar is representative of an engineering hard low limit for the process variable.
3. The graphical user interface of claim 1, wherein the one or more bars extending along the gauge axis include a first bar extending along the gauge axis, wherein a first end of the first bar is representative of an operator set high limit for the process variable and a second end of the first bar is representative of an operator set low limit for the process variable.
4. The graphical user interface of claim 3, wherein the one or more bars extending along the gauge axis further include a delta soft high region within the first bar and adjacent the first end thereof and a delta soft low region within the first bar and adjacent the second end thereof, and further wherein the delta soft high region and the delta soft low region are representative of a delta optimization range within the operator set high and low limits.

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5. The graphical user interface of claim 1, wherein the one or more bars extending along the gauge axis include:
- a first bar extending along the gauge axis, wherein a first end of the first bar is representative of an engineering hard high limit for the process variable and a second end of the first bar is representative of an engineering hard low limit for the process variable; and
 - a second bar extending along the gauge axis, wherein a first end of the second bar is representative of an operator set high limit for the process variable and a second end of the second bar is representative of an operator set low limit for the process variable.
6. The graphical user interface of claim 5, wherein the second bar extending along the gauge axis representative of operator set high and low limits for the process variable extends along the gauge axis within the first bar representative of the engineering hard high and low limits for the process variable.
7. The graphical user interface of claim 6, wherein the one or more bars extending along the gauge axis further include a delta soft high region within the second bar and adjacent the first end thereof and a delta soft low region within the second bar and adjacent the second end thereof, and further wherein the delta soft high region and the delta soft low region are representative of a delta optimization range within the operator set high and low limits.
8. The graphical user interface of claim 7, wherein the delta soft high region and the delta soft low region overlap within the second bar to provide for optimization to a pseudo set point.
9. The graphical user interface of claim 1, wherein the graphical user interface further includes user manipulation elements movable to change one or more of the high and low process limit values.

10. The graphical user interface of claim 9, wherein the scale extending along the gauge axis is automatically adjustable as a function of the movement of the user manipulation elements.
- 5 11. The graphical user interface of claim 9, wherein the user manipulation elements include one or more manipulation pointer flags associated with operator set limits, the one or more manipulation pointer flags are draggable along the gauge axis to change such operator set limits.
- 10 12. The graphical user interface of claim 9, wherein the user manipulation elements include one or more manipulation pointer flags associated with the engineering hard limits, the one or more manipulation pointer flags are draggable along the gauge axis to change such engineering hard limits.
- 15 13. The graphical user interface of claim 1, wherein the graphical shape representative of the current value of the process variable is a pointing device proximate to the scale.
14. The graphical user interface of claim 1, wherein the graphical user interface
20 further includes at least one additional graphical shape displayed along the gauge axis representative of at least one additional value for the process variable.
15. The graphical user interface of claim 14, wherein the additional graphical shape representative of at least one additional value for the process variable has a
25 color of a set of colors that reflects the state of the current value for the process variable relative to the set of high and low process limit values.
16. The graphical user interface of claim 1, wherein the scale extending along the gauge axis is adjustable as a function of a current value of the process variable
30 relative to the one or more process limits values.

17. The graphical user interface of claim 1, wherein the graphical shape representative of the current value of the process variable has a color of a set of colors that reflects the state of the current value for the process variable relative to the set of high and low process limit values.

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18. The graphical user interface of claim 17, wherein a color for the graphical shape represents one of a current value of the corresponding process variable being within the set of high and low process limit values, the current value of the corresponding process variable being within a certain percentage of a limit value of
10 the set of high and low process limit values, and the current value of the corresponding process variable being outside of the set of high and low process limit values.

19. The graphical user interface of claim 1, wherein a background of a region
15 adjacent the one or more bars along the gauge axis is of a color when the graphical shape representative of the current value of the process variable is outside of the high and low process limit values, and further wherein the region is representative of engineering physical limits of the process variable.

20. The graphical user interface of claim 1, wherein the graphical user interface further includes a trend graph for the process variable.

21. The graphical user interface of claim 20, wherein the trend graph includes at least one of a historical trend graph and a prediction trend graph for displaying trend
25 information representative of process variable values.

22. The graphical user interface of claim 20, wherein the trend graph includes at least one of a historical trend graph and a prediction trend graph for displaying trend information representative of process variable limits.

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23. The graphical user interface of claim 1, wherein the one or more process variables include a plurality of manipulated variables and a plurality of controlled variables of a continuous multivariable process.

5 24. A computer implemented method for providing a graphical user interface for providing real-time process information to a user for a process that is operable under control of one or more process variables, the method comprising:

displaying a scale extending along a gauge axis;

10 displaying one or more bars extending along the gauge axis, each bar representative of a set of high and low process limit values for a process variable;

providing data representative of at least the current value of the process variable; and

15 displaying a graphical shape along the gauge axis representative of the current value of the process variable relative to the set of high and low process limit values.

25. The method of claim 24, wherein displaying one or more bars extending along the gauge axis includes displaying a first bar extending along the gauge axis, wherein a first end of the first bar is representative of an engineering hard high limit for the process variable and a second end of the first bar is representative of an engineering hard low limit for the process variable.

26. The method of claim 24, wherein displaying one or more bars extending along the gauge axis includes displaying a first bar extending along the gauge axis, wherein a first end of the first bar is representative of an operator set high limit for the process variable and a second end of the first bar is representative of an operator set low limit for the process variable.

27. The method of claim 26, wherein displaying one or more bars extending along the gauge axis further includes displaying a delta soft high region within the first bar and adjacent the first end thereof and a delta soft low region within the first

bar and adjacent the second end thereof, and further wherein the delta soft high region and the delta soft low region are representative of a delta optimization range within the operator set high and low limits.

5 28. The method of claim 24, wherein displaying one or more bars extending along the gauge axis includes:

displaying a first bar extending along the gauge axis, wherein a first end of the first bar is representative of an engineering hard high limit for the process variable and a second end of the first bar is representative of an engineering hard
10 low limit for the process variable; and

displaying a second bar extending along the gauge axis, wherein a first end of the second bar is representative of an operator set high limit for the process variable and a second end of the second bar is representative of an operator set low limit for the process variable.

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29. The method of claim 28, wherein displaying the one or more bars extending along the gauge axis includes displaying the second bar extending along the gauge axis representative of the operator set high and low limits for the process variable within the first bar representative of engineering hard high and low limits for the
20 process variable.

30. The method of claim 29, wherein displaying one or more bars extending along the gauge axis further includes displaying a delta soft high region within the second bar and adjacent the first end thereof and a delta soft low region within the
25 second bar and adjacent the second end thereof, and further wherein the delta soft high region and the delta soft low region are representative of a delta optimization range within the operator set high and low limits.

31. The method of claim 29, wherein displaying the delta soft high region within
30 the second bar and adjacent the first end thereof and a delta soft low region within the second bar and adjacent the second end thereof includes:

receiving user input representative of the delta values; and
displaying a delta soft high region and a delta soft low region that overlap
providing for an optimization pseudo set point within the operator set high and low
limits.

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32. The method of claim 31, wherein the optimization pseudo set point is
proportional to the delta soft high region and delta soft low region.

33. The method of claim 24, wherein the method further includes:
10 displaying user manipulation elements movable to change one or more of the
high and low process limit values;
moving such user manipulation elements to generate data representative of
changed high or low process limit values; and
providing such data to a controller of the process.

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34. The method of claim 33, wherein the method further includes rescaling the
scale extending along the gauge axis as a function of the movement of the user
manipulation elements.

20 35. The method of claim 33, wherein moving such user manipulation elements
to generate data includes dragging one or more manipulation pointer flags associated
with the operator set limits along the gauge axis to change such operator set limits.

36. The method of claim 33, wherein moving such user manipulation elements
25 to generate data includes dragging one or more manipulation pointer flags associated
with the engineering hard limits along the gauge axis to change such engineering
hard limits.

37. The method of claim 33, wherein moving such user manipulation elements
30 to generate data includes dragging one or more manipulation pointer flags associated
with the delta soft limits along the gauge axis to change such delta soft limits.

38. The method of claim 24, wherein the graphical shape representative of the current value of the process variable is a pointing device proximate to the scale
5 extending along the gauge axis.

39. The method of claim 24, wherein the method further includes displaying at least one additional graphical shape along the gauge axis representative of an additional value for the process variable.

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40. The method of claim 39, wherein displaying the at least one additional graphical shape includes displaying at least one additional pointing device proximate to the scale extending along the gauge axis.

15 41. The method of claim 24, wherein the method further includes rescaling the scale extending along the gauge axis as a function of the current value of the process variable relative to the set of high and low process limit values.

42. The method of claim 24, wherein displaying the graphical shape
20 representative of the current value of the process variable includes:
determining a state of the current value of the process value relative to the set of high and low process limit values; and
displaying the graphical shape in a color of a set of colors that reflects the state of the current value for the process variable.

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43. The method of claim 42, wherein determining the state of the current value of the process value relative to the set of high and low process limit values includes determining whether the current value of the process variable is within the set of high and low process limit values, determining whether the current value of the
30 process variable is within a certain percentage of a limit value of the set of high and low process limit values, and determining whether the current value of the process

variable is a certain percentage outside of the set of high and low process limit values.

44. The method of claim 24, wherein the method further includes:

5 determining whether the current value of the process variable is outside of the set of high and low process limit values; and

displaying a graphical element representative of engineering physical limits of the process variable when the current value of the process variable is outside the set of high and low process limit values.

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45. The method of claim 44, wherein displaying a graphical element representative of engineering physical limits of the process variable includes displaying a background region adjacent the one or more bars along the gauge axis in a particular color representative of engineering physical limits.

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46. The method of claim 24, wherein the method further includes displaying a trend graph for the process variable with the displayed scale, one or more bars, and the graphical shape representative of the current value of the process variable.

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47. The method of claim 46, wherein displaying the trend graph includes displaying at least one of a historical trend graph and a prediction trend graph for the process variable representative of process variable values.

48. The method of claim 46, wherein displaying the trend graph includes

25 displaying at least one of a historical trend graph and a prediction trend graph for the process variable representative of process variable limits.

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